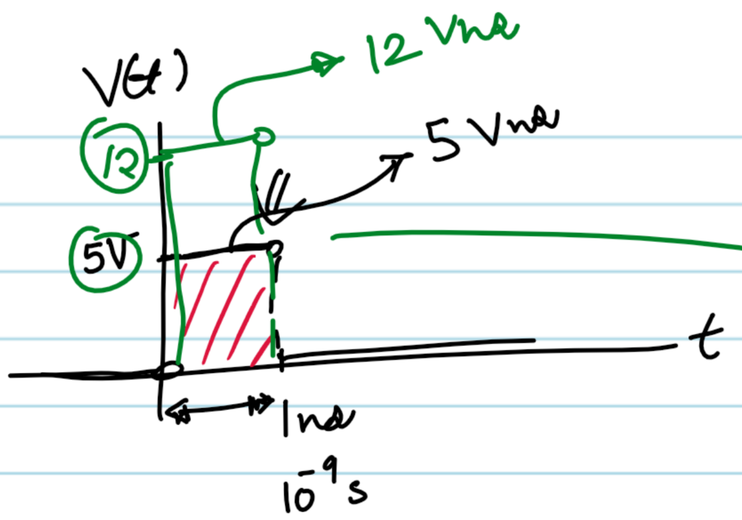
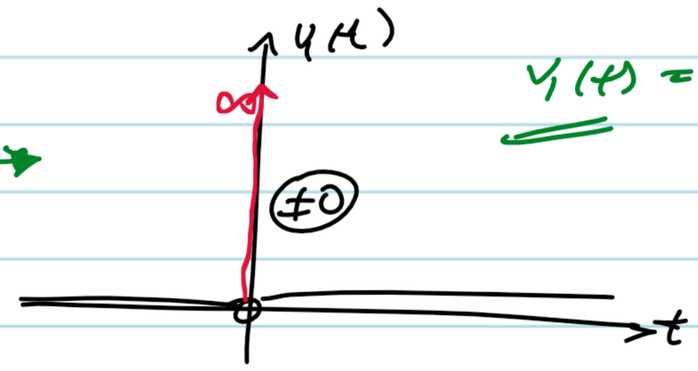
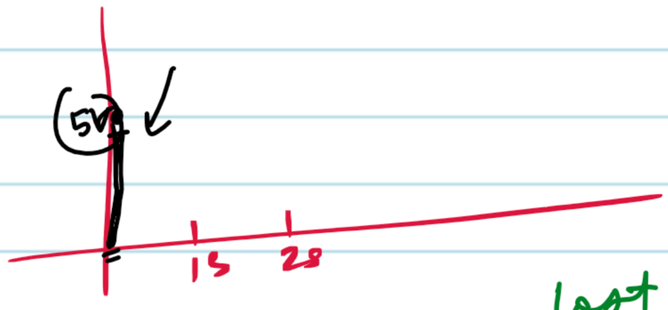


$V(t) \simeq \boxed{V_1(t)}$



$$V_1(t) = \begin{cases} 0, & t \neq 0 \\ \infty, & t = 0 \end{cases}$$

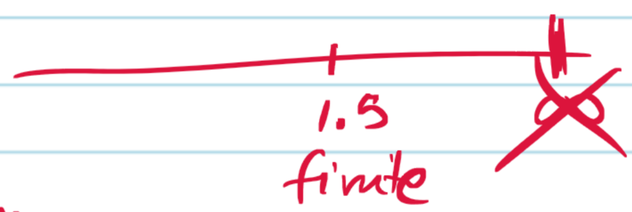


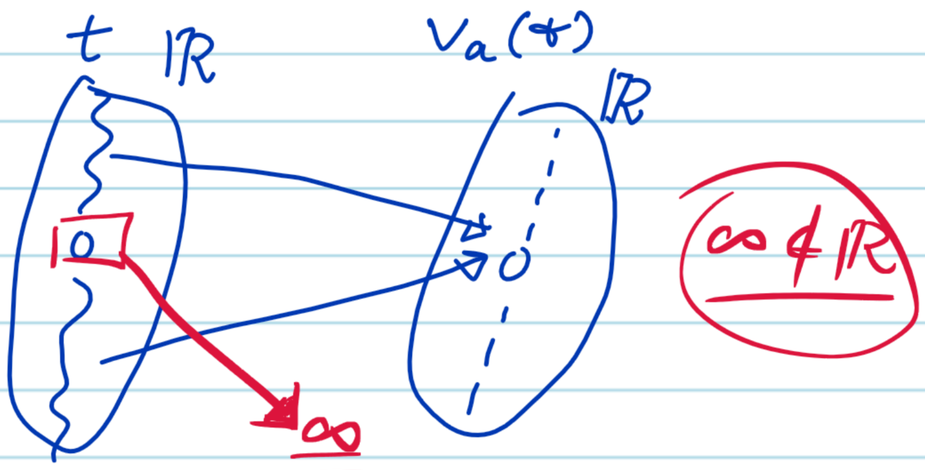
$$V_1(t) = \begin{cases} 1) \ t \neq 0 \longrightarrow 0 \\ 2) \ t = 0 \longrightarrow \infty \\ 3) \ \text{area} = 5 \ \text{Vns} \end{cases}$$

lost

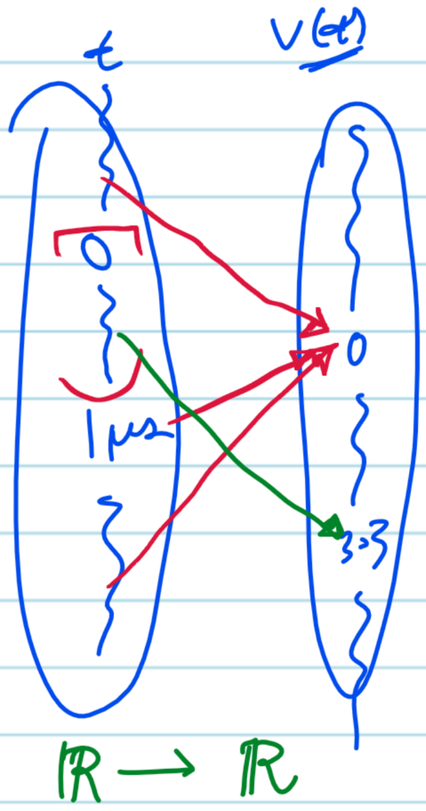
$\pi = 3.14\underline{15926}\ldots$

$\simeq 3.14$

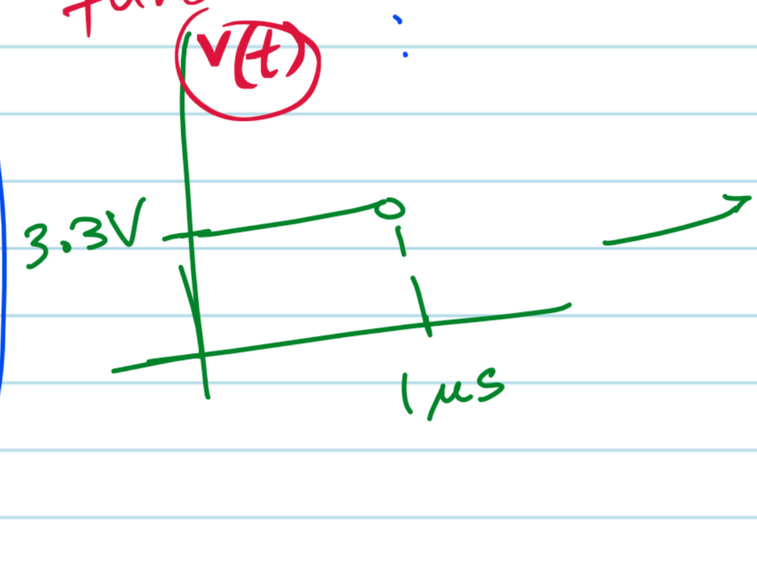


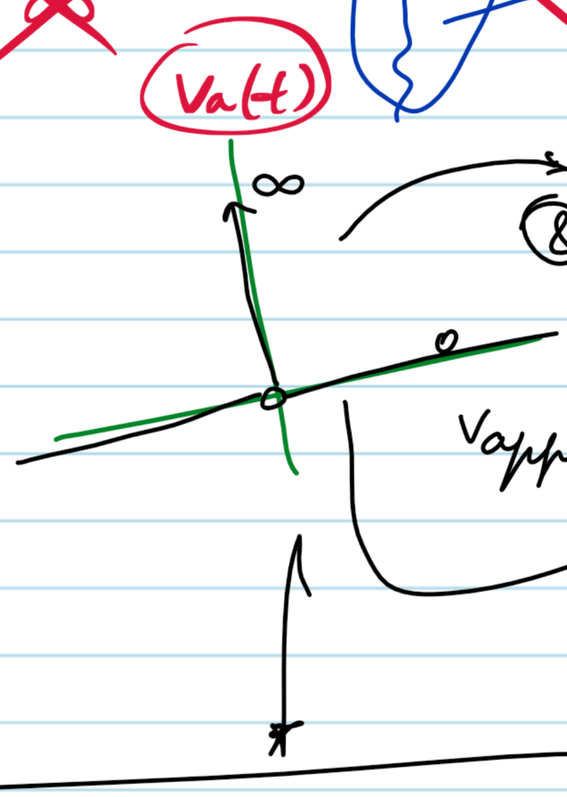


$\infty \notin \mathbb{R}$



function





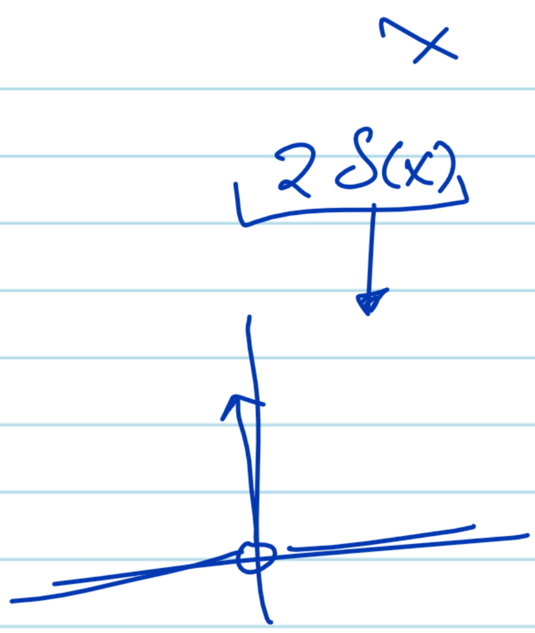
② area = 3.3 Vμs

$V_{appr}(x) = 3.3 \text{Vμs} \times \delta(t)$

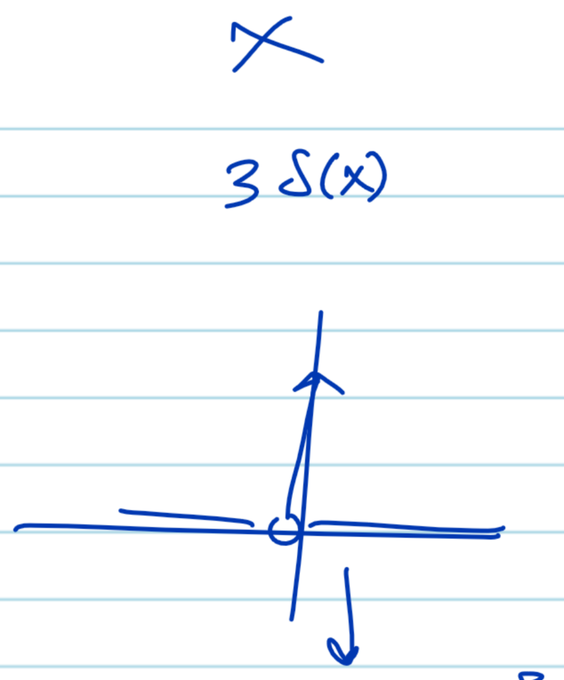
$$\delta(x) = \begin{cases} 0, & x \neq 0 \\ \infty, & x = 0 \end{cases} \quad \text{such that} \quad \int_{\mathbb{R}} \delta(x)\,dx = 1$$

Generalized function / Distribution.

∫ test function

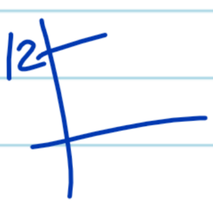


$\neq$



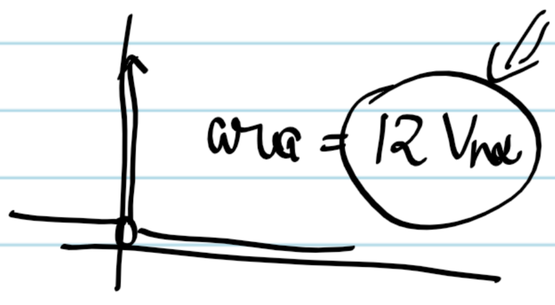
$V_1(t) = 5\,\delta(t)$ Vms

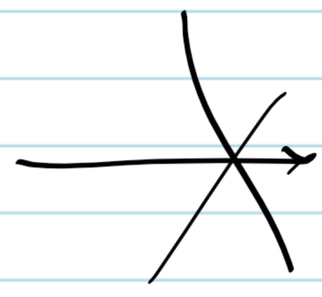
$V_2(t) = 12 \cdot \delta(t)$ Vms



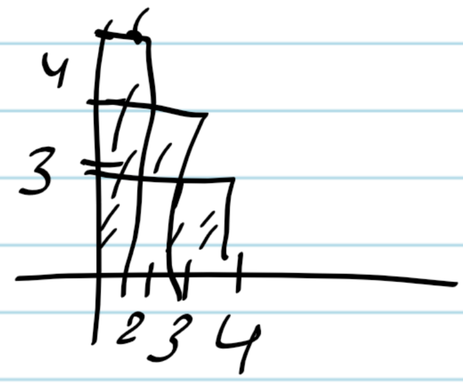
$\pi = 3.14159\ldots$

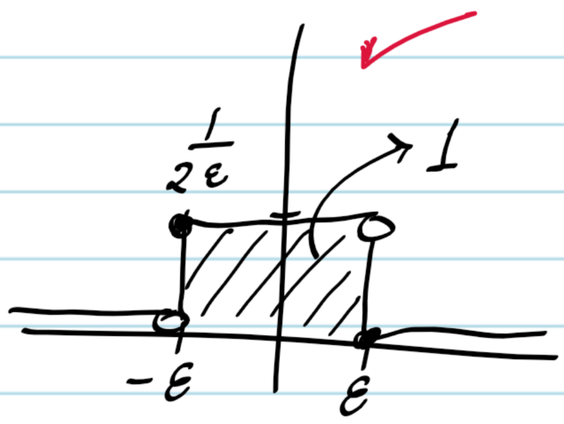
≈ 3.14

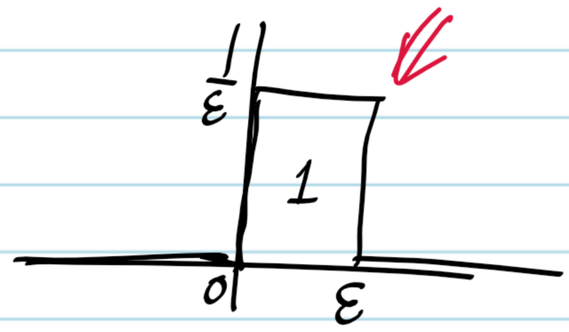


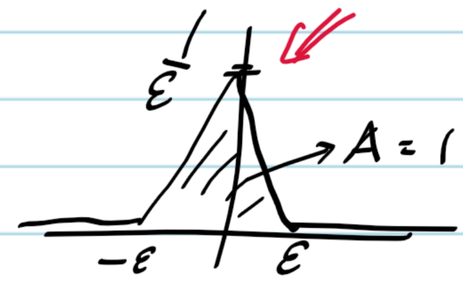


accuracy?

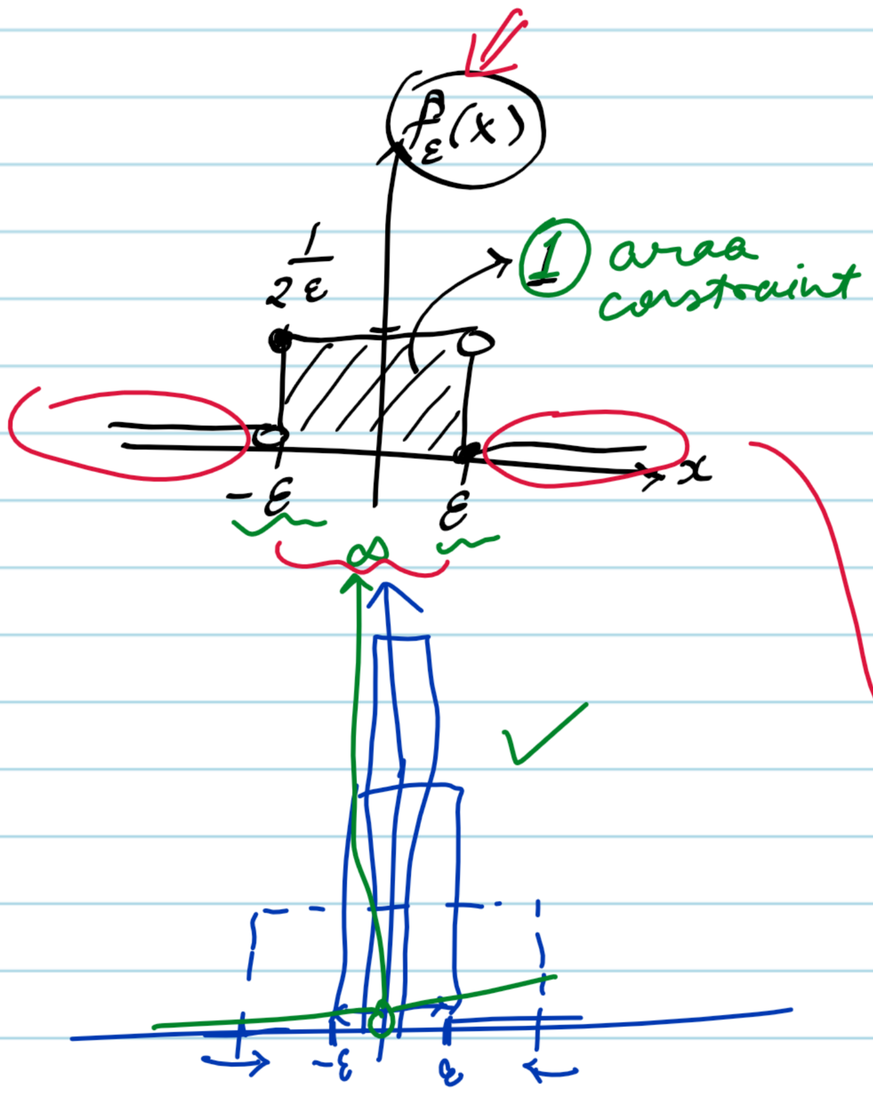








$\varepsilon \to 0$



$$\delta(x) = \begin{cases} 0, & x \neq 0 \quad (1) \\ \infty, & x = 0 \quad (2) \end{cases}$$

$$\text{Area} = 1 \quad \text{constraint}$$

$$\lim_{\varepsilon \to 0} f_\varepsilon(x) = \delta(x)$$

$$\int_{-\infty}^{\infty} f_\varepsilon(x)\,dx = \int_{-\varepsilon}^{\varepsilon} \frac{1}{2\varepsilon}\,dx$$

$$= \frac{1}{2\varepsilon} \times 2\varepsilon = 1$$

$$\int_{-\infty}^{\infty} \lim_{\varepsilon \to 0} f_\varepsilon(x)\,dx = 1$$

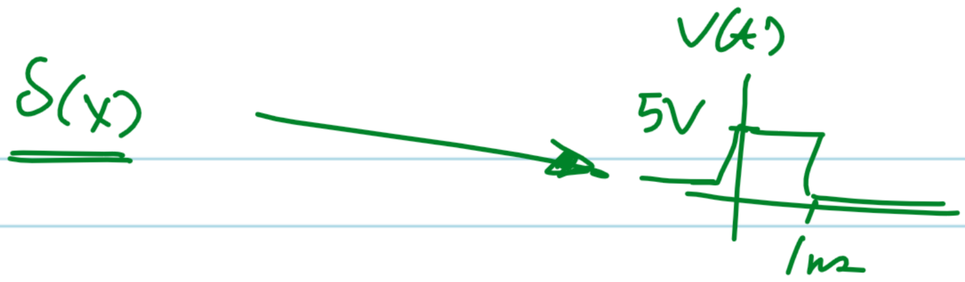
$$\delta(x) = \int_{-\infty}^{\infty} e^{i(2\pi x)p}\,dp$$

$x \neq 0$ → 0

$x = 0$ → ∞

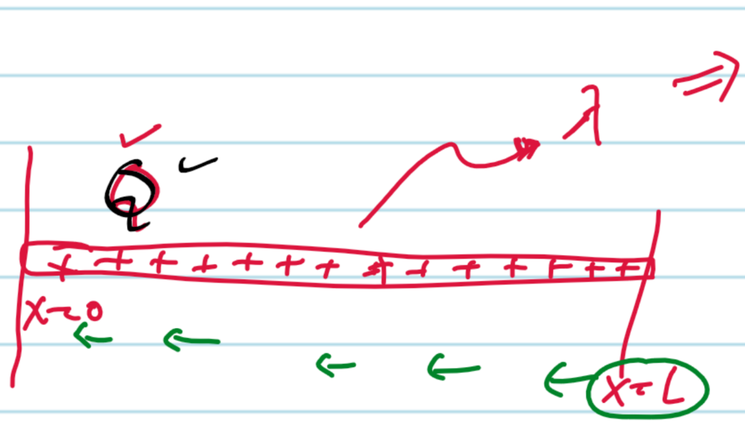
total area = 1

HC Verma sir



point charge

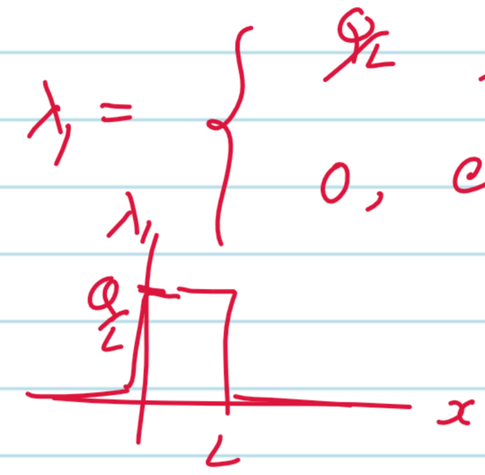
• e^-
electron
as a point charge

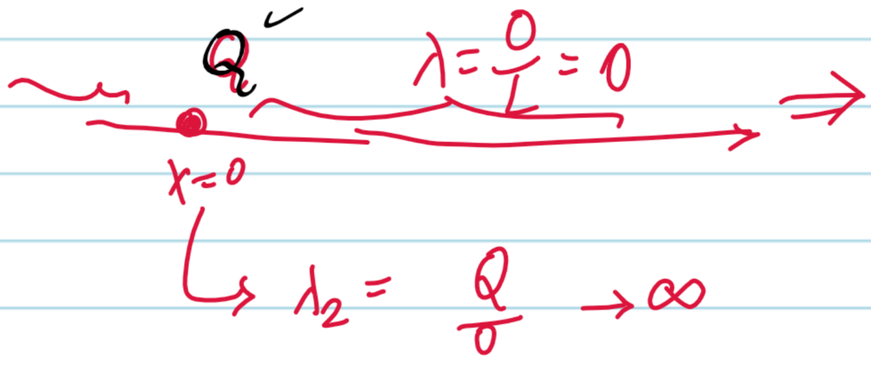


$\Rightarrow \lambda_1 = \frac{Q}{L}$

$L \to 0$

$$\lambda_1 = \begin{cases} \frac{Q}{L}, & 0 < x < L \\ 0, & \text{else} \end{cases}$$



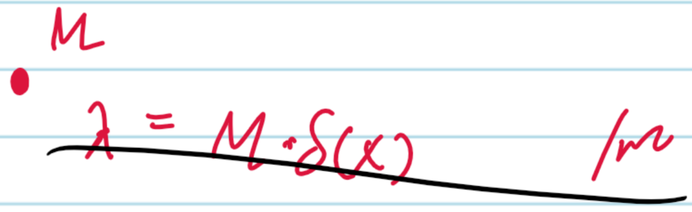


$\hookrightarrow \lambda_2 = \frac{Q}{0} \to \infty$

$$\lambda_2 = \begin{cases} 0, & x \neq 0 \\ \infty, & x = 0 \end{cases}$$

$$\text{tot charge} = Q = \int_{-\infty}^{\infty} \lambda \, dx$$

$\lambda_2 = Q\,\delta(x)$ /m



*and point mass has applications in
Mechanics, Newton's Laws, Relativity, etc.

Definitions [edit]

The Dirac delta function $\delta(x)$ can be loosely thought of as a function on the real line which is zero everywhere except at the origin, where it is infinite,

$$\delta(x) \simeq \begin{cases} +\infty, & x = 0 \\ 0, & x \neq 0 \end{cases}$$

and which is also constrained to satisfy the identity[23]

$$\int_{-\infty}^{\infty} \delta(x)\,dx = 1.$$

This is merely a heuristic characterization. The Dirac delta is not a function in the traditional sense as no extended real number valued function defined on the real numbers has these properties.[24]

- δ(x) is called Dirac delta function or Unit Impulse function (because its total definite integral over real line is 1 and it was introduced by Paul Dirac).
- Because δ(x) provided a way to model point charge from a charge distribution (such as a uniformly charged rod); later the name "Distribution" was coined by Laurent Schwartz.
- So Dirac delta function is also called Dirac delta distribution.
- Distribution is other name for Generalized functions.